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(71) Applicants
Etablissements Petzl (France),
Zone Industrielle de Crolles, 38190 Brignoud, France
(72) Inventors
Paul Petzl,
Pierre Petzl
(74) Agents
Forrester Ketley and Co.,
Forrester House, 52
Bounds Green Road,
London N11 2EY

(54) **Improvements in or relating to electric lamps**

(57) An electric lamp is described which comprises a first subassembly (12) in which is rigidly secured a reflector (18) and a second subassembly (14) in which is supported a bulb (16) and switching means for connecting the bulb to a power source, the subassemblies being movable relative to one another to move the reflector (18) relative to the bulb (16), the arrangement being such that, when the reflector is moved relative to the bulb between a first focus adjustment position and a second focus adjustment position, a contact (36) of the switching means biased by resilient means (42) into contact with a connecting terminal (44) of the bulb (16) remains stationary and in contact with the connecting terminal so that power is supplied to the bulb (16) but when the reflector is moved relative to the bulb to position outside the range of positions defined between the first and second focus adjustment positions the contact (36) of the switching means is moved out of contact with the connecting terminal (44) of the bulb against the biasing force of the resilient means (42).

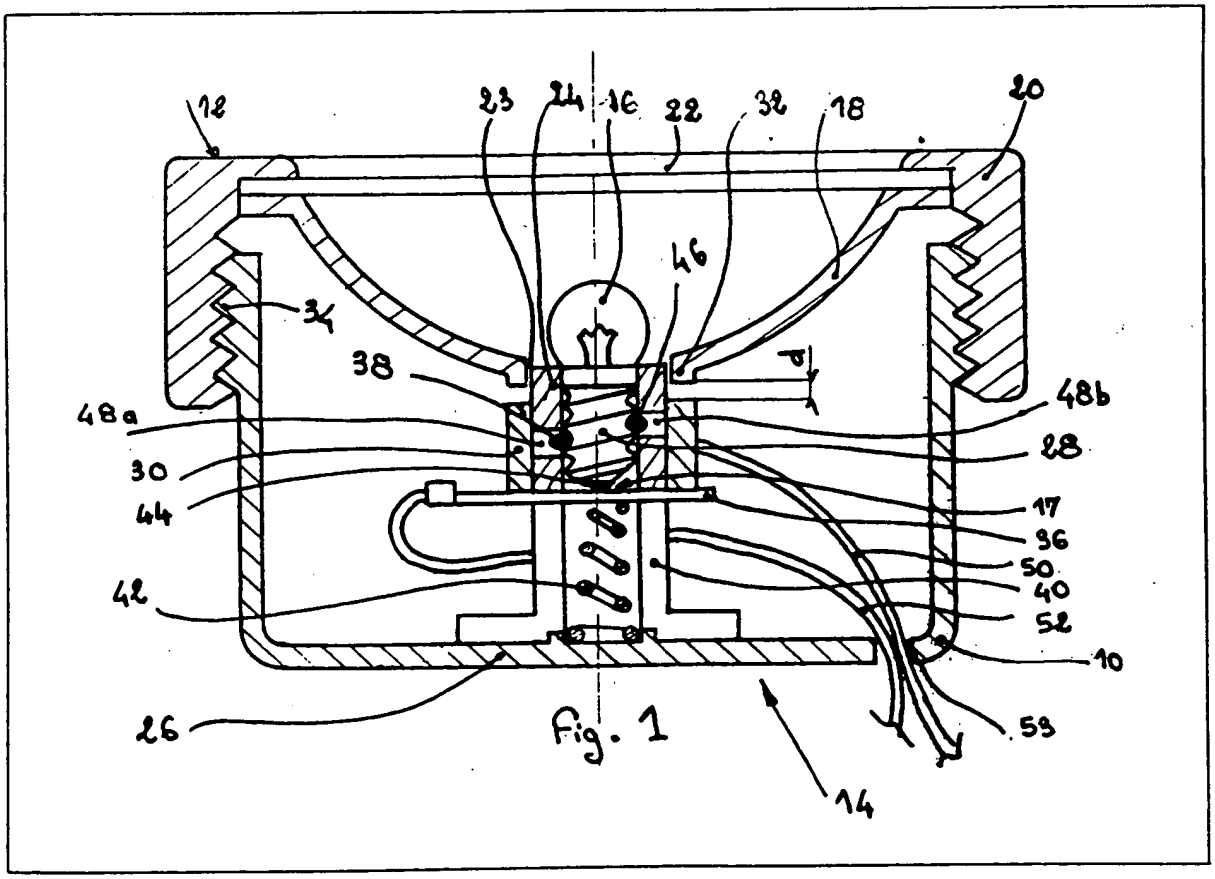

Fig. 1

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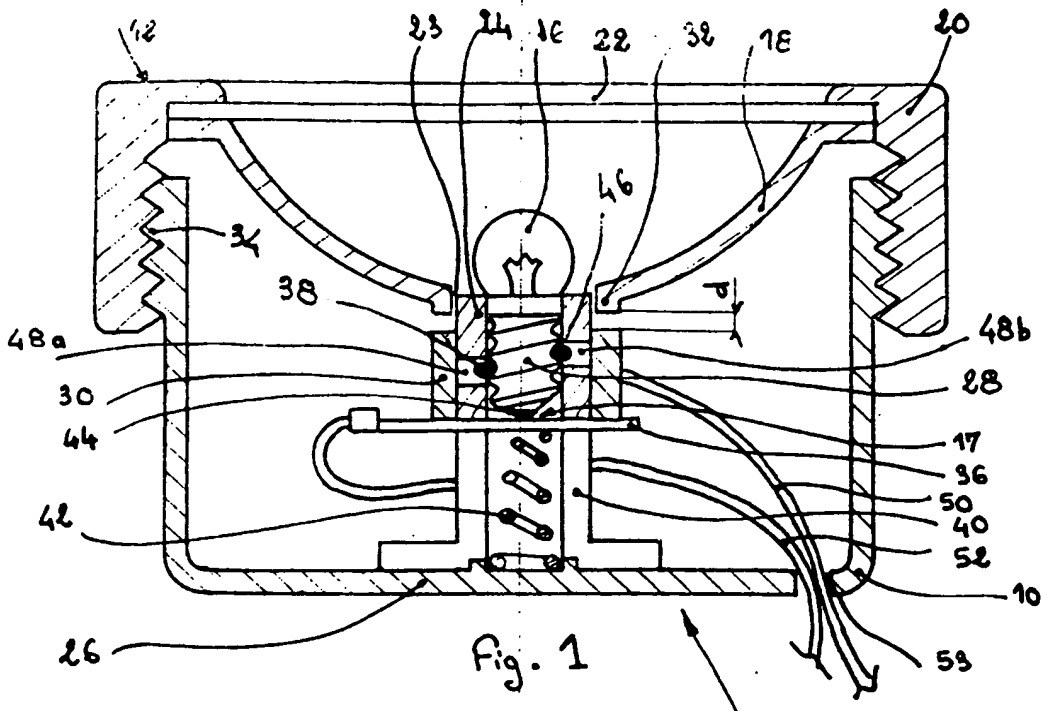

Fig. 1

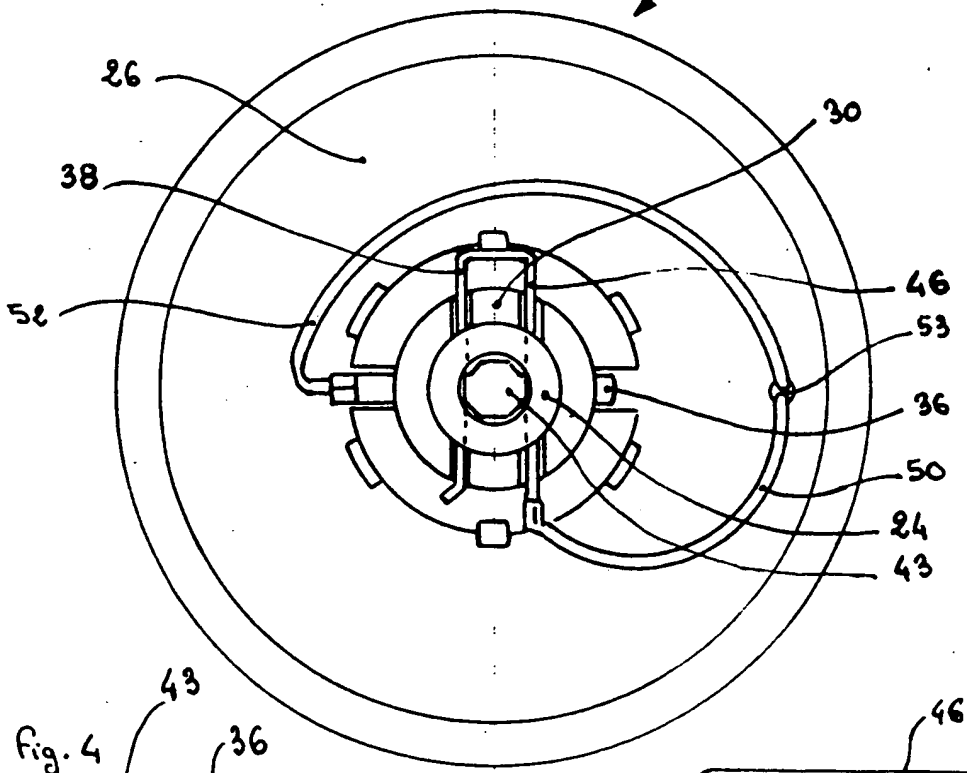

Fig. 2

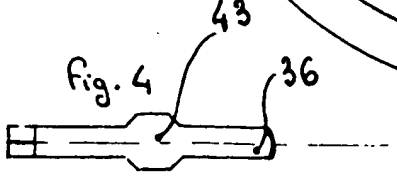

Fig. 4

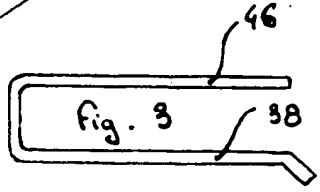

Fig. 3

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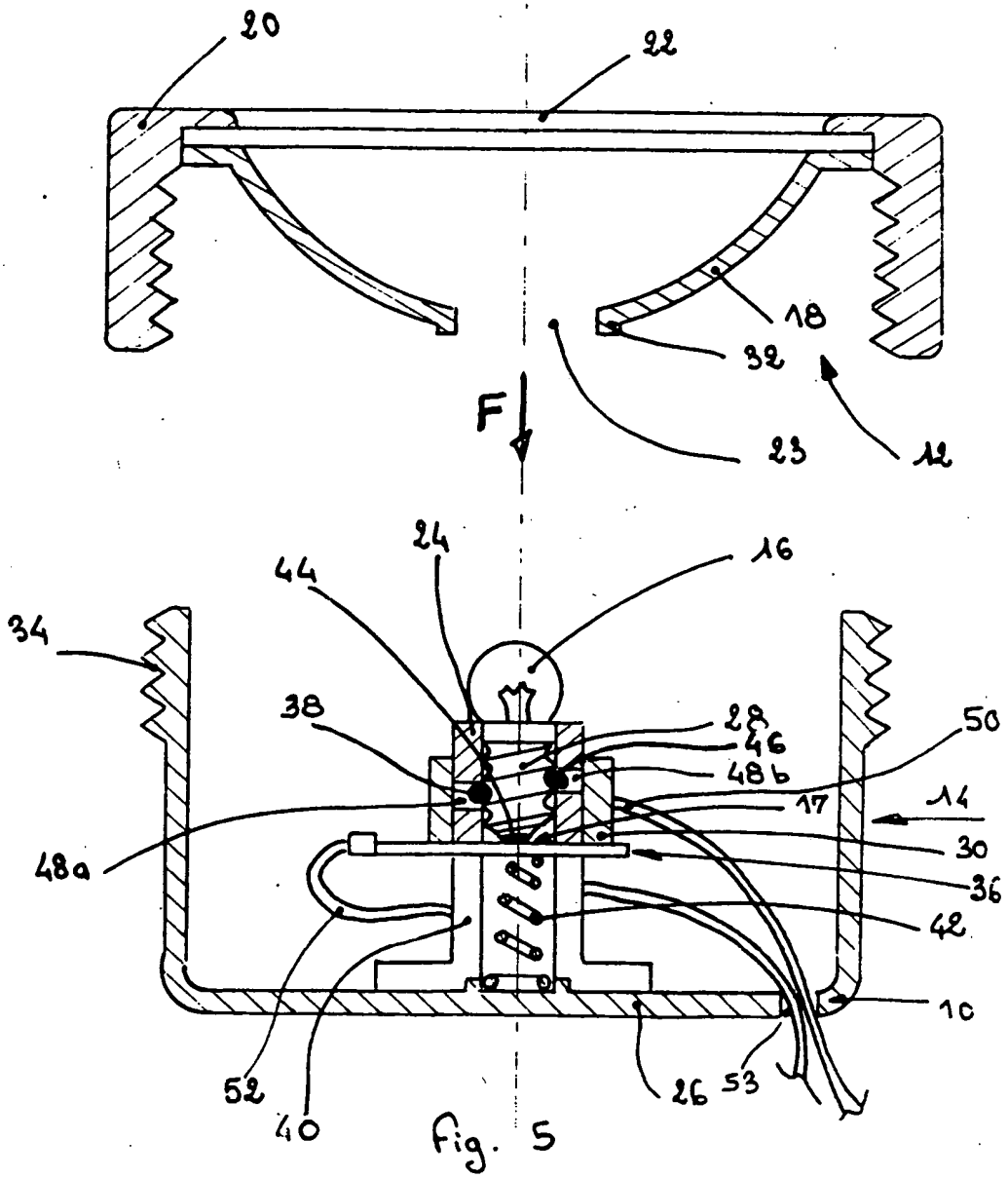

Fig. 5

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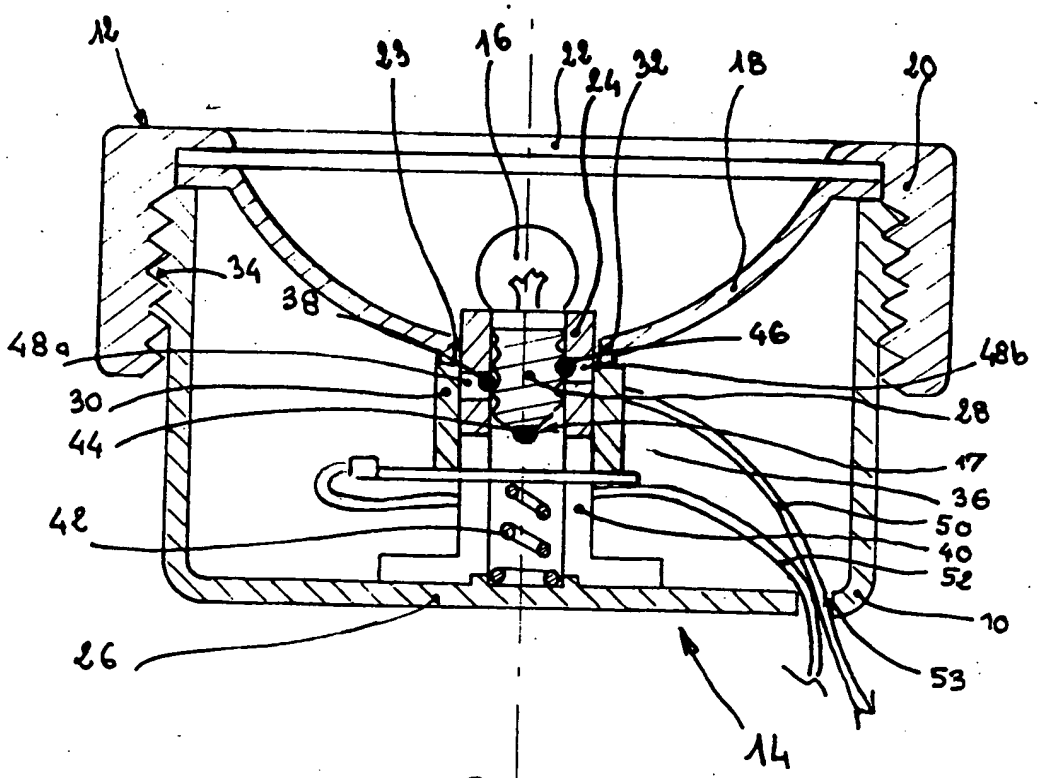

Fig. 6

SPECIFICATION

Improvements in or relating to electric lamps

This invention relates to improvements in or relating to electric lamps comprising a reflector, an electric bulb electrically connected to a power supply by way of a switch and means for controlling both the switch and focus adjustment in accordance with relative movement between the bulb and the reflector.

French Patent Specification 1 430 456 and German Patent Specification 839 828 both disclose a lamp of the above-mentioned kind wherein jointed means are provided for adjusting the focal point and controlling the switch. In each case, the switch has a rotary action which complicates the construction of the common adjusting means. French Patent Specification No. 2 372 382, describes a lamp wherein the switch comprises a movable bulb holder engageable with a fixed contact as a result of movement of the reflector.

It is an object of the invention to provide a reliable lamp which has a simple and cheap switch.

According to the present invention, there is provided an electric lamp comprising a first subassembly in which is rigidly secured a reflector and a second subassembly in which is supported a bulb and switching means for connecting the bulb to a power source, the subassemblies being movable relative to one another to move the reflector relative to the bulb the arrangement being such that, when the reflector is moved relative to the bulb between a first focus adjustment position and a second focus adjustment position, a contact of the switching means biased by resilient means into contact with a connecting terminal of the bulb remains both stationary and in contact with the connecting terminal so that power is supplied to the bulb but when the reflector is moved relative to the bulb to a position outside the range of positions defined between the first and second focus adjustment positions the contact of the switching means is moved out of contact with the connection terminal of the bulb against the biasing force of the resilient means.

In order that the invention may be readily understood, an embodiment thereof will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a sectional view of an electric lamp for illumination in accordance with the invention with a switch thereof in a closed position;

Figure 2 is a plan view from above of the lamp of Figure 1 with a first subassembly comprising the reflector removed and without the bulb;

Figure 3 shows a rider providing a connection to a screw cap of the bulb of the lamp;

Figure 4 shows a semi-fixed contact of the switch of the lamp;

Figure 5 is a sectional view similar to Figure 1 but with the first subassembly shown removed from the lamp; and

Figure 6 is a sectional view similar to Figure 1 but with the switch in an open position;

Referring now to the drawings, an electric lamp for illumination, *inter alia* a headlamp for mountaineering or potholing, has a casing 10 divided into two separate subassemblies 12 and 14 adapted to co-operate with one another to operate a switch 17 for switching a bulb 16 on and off and also to serve as a means for concentrating or diffusing the beam emitted by the bulb 6 when the switch 17 is in its closed position.

The subassembly 12 comprises a parabolic reflector 18 which is rigidly secured to a ring 20 made of an electrically insulating material. The inside lateral surface of the rig is screw-threaded so that the ring forms a ring nut to engage an externally screw-threaded end 34 of the casing 10. One end of the ring nut 20 is closed by a cylindrical transparent screen 22 which, when the first and second subassemblies 12 and 14 cooperate, protects the reflector 18 and the bulb 16. A cylindrical aperture 23 through which the bulb 16 can extend is formed through the centre of the reflector 18.

The other subassembly 14 is adapted to support the bulb 16 and the switch 17 associated therewith. A tubular bulb holder 24 is secured to end 26 of the lamp casing 10 by any form of assembly, for example, riveting, sticking or clipping. The outside diameter of the stationary holder 24 is slightly less than the diameter of the reflector aperture 23 and the inside diameter of the bulb holder 24 is substantially the same as that of a metal screw cap 28 of the bulb 26. A semi-fixed electrically insulating sleeve 30 for actuating the switch 17 extends coaxially around the holder 24 and can be moved to a limited extent by an annular shoulder 32 of reflector 18 to open the switch 17 in its limit position.

The bulb holder 24 is made of an electrically insulating material and the bulb 16, which is a conventional commercially available item, is connectable to a power source by means of two electrical contacts 36 and 38 received in the casing 10.

Contact 36 is in the form of a semi-fixed bridge extending transversely across an orifice 40 in holder 24. A compression spring 42 is received coaxially in holder 24 between the end 26 and contact 36 to urge a widened central zone 43 of the contact 36 into engagement with an isolated terminal 44 of the filament of the bulb 16. The switch 17 comprises the bridge-like semi-fixed contact 36 cooperating with the sleeve 30 in dependence upon the axial position of the reflector 18. When a person begins to screw the sub-assembly 12 on to the screw-threaded end 34 of the sub-assembly 14, a lost motion distance of variable length *d* is left between the annular shoulder 32 of the reflector and the sleeve 30. Switch 17 is then in the closed state or position because the spring 42 keeps the bridge contact 36 in engagement with the bulb terminal 44. After the lost motion distance has been taken up by

movement of sub-assembly 12 as it is screwed further onto sub-assembly 14, the reflector 18, as it moves, moves the sleeve 30 towards a position remote from the contact bridge 36 against the force of spring 42, thus separating the contact 36 from bulb terminal 44 so that the switch 17 is in the open condition or state (Figure 6).

The other contact 38 comprises a rider 46 or hairpin-like member for earthing the metal screw cap 28 which forms the other terminal of the bulb 16. The rider 46 extends perpendicularly of the contact 36 and takes the form of a horseshoe-shaped conductive metal wire. The straight arms of the rider 46 are disposed in a pair of recesses 48*a* and 48*b* formed in the holder 24 and the radial gap left between the two arms of the rider 46 corresponds substantialy to the base diameter pitch of the bulb cap 28. There is a small offset between the recesses 48*a* and 48*b* corresponding to one-half of the pitch of the screw-thread of the bulb cap 28. The rider 46 and the contact 36 are connected to two electrically conductive wires of cables 50 and 52 which extend through an orifice 53 into the casing 10, to connect the lamp 16 to an external power supply, for example, a battery (not shown). In addition to providing the electrical connection between the bulb cap 28 and, for example, one pole of the battery, the rider 46 locates the bulb 16 securely in the holder 24, the inside lateral surface of which is not screw-threaded. Where the power supply is a battery, a conventional type battery casing (not shown) will be provided, for example a casing of the type disclosed in French Patent Specification No. 2 305 684.

The lamp operates in the following manner.

The subassembly 12 is removed from the subassembly 14 as shown in Figure 5 to allow the bulb 16 to be placed in the holder 24 of the subassembly 14 by rotation of the bulb cap 28 on the rider 46 once the rider 46 has been positioned securely in the recesses 48*a* and 48*b* in the holder 24. The bulb 16 is rotated until the terminal 24 engages the contact zone 43 of the bridge 36. The opposite surface of the bridge is acted on by the spring 42 and the switch 17 is then in its closed position so that bulb 16 is energized and lights up.

The reflector subassembly 12 is then fitted to the subassembly 14, in the direction indicated by arrow F in Figure 5, by screwing the ring nut 20 onto the screw-threaded end 34 of the casing 10 (Figure 1). The helical movement of the ring nut 20 causes the reflector 18 to move towards the sleeve 30. The lost motion distance *d* between reflector shoulder 32 and sleeve 30 decreases proportionately as the ring nut 20 is screwed further onto the screw-threaded end 34. The reduction in the distance *d* causes the focal point of the parabolic reflector 18 to be moved towards the bulb 16 which remains stationary. Consequently, there is a progressive concentration of the light beam emitted by the bulb 16, the concentration reaching a maximum when all the lost motion distance or backlash *d* has been taken up, at which point the sleeve 30 will be caused by the reflector 18 to engage the contact bridge 36.

If the ring 20 is screwed further onto the screw-threaded end 34, the sleeve 30 and contact bridge 36 are moved through a reduced distance against the force of compression spring 42. Because the bulb 16 remains stationary, this movement of the sleeve 30 causes the terminal 44 to disengage from the contact bridge 36 so that switch 17 is in its open state or condition when the reflector 18 is in its limit position as shown in Figure 6, causing the bulb 16 to go out. The spring 42 is at maximum compression when the switch 17 is in its open state.

The above sequence of operations is reversed to switch on the bulb 16. Unscrewing the ring 20 causes the sleeve 30 to move under the biasing force of the spring 42 to bring the contact bridge 36 into contact with the contacting terminal 44. Switch 17 is then in the closed state and the bulb 16 is alight.

Further unscrewing of ring 20 moves the focal point of reflector 18 further away from the stationary bulb 16. Consequently, there is a progressive diffusion of the light beam emitted by the bulb 16.

CLAIMS

1. An electric lamp comprising a first subassembly in which is rigidly secured a reflector and a second subassembly in which is supported a bulb and switching means for connecting the bulb to a power source, the subassemblies being movable relative to one another to move the reflector relative to the bulb, the arrangement being such that, when the reflector is moved relative to the bulb between a first focus adjustment position and a second focus adjustment position, a contact of the switching means biased by resilient means into contact with a connecting terminal of the bulb remains both stationary and in contact with the connecting terminal so that power is supplied to the bulb but when the reflector is moved relative to the bulb to a position outside the range of positions defined between the first and second focus adjustment positions the contact of the switching means is moved out of contact with the connection terminal of the bulb against the biasing force of the resilient means.

2. A lamp according to claim 1, wherein the bulb is received in a holder secured to the second subassembly and the contact of the switching means is in the form of a bridge member extending across an orifice in the holder.

3. A lamp according to claim 2, wherein the resilient means for biasing the contact of the switching means into contact with the bulb connecting terminal comprises a compression spring disposed in the holder between an end of a casing of the second subassembly and the switching means contact.

4. A lamp according to claim 1 or 2 or 3, wherein an insulating material sleeve 30 is disposed between the switching means contact

and the reflector and is normally spaced from the reflector by a distance equal to the distance between the first and second focus adjustment positions.

5. A lamp according to claim 4, wherein the sleeve extends around the holder and interferes with the relative movement of the reflector and the bulb to move the switching means contact out of contact with the bulb connection terminal when the bulb is moved relative to the reflector to a position outside the range defined by the first and second focus adjustment positions.

6. A lamp according to any one of claims 2 to 5, wherein the holder is made of an insulating material and a conductive rider disposed in recesses in the holder provides electrical connection for a metal screw cap of the bulb and serves to retain the bulb in the holder.

7. A lamp according to claim 6, wherein the rider is in the form of a U-shaped metal wire, the distance between the arms of the U-shaped metal wire corresponding substantially to the base diameter pitch of the bulb screw cap.

8. A lamp according to claim 6 or 7, wherein the recesses in the holder are offset from one another by a distance corresponding to one-half the pitch of the thread of the bulb screw cap.

9. An electric lamp substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

10. Any novel feature or combination of features described herein.

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